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Oliff & Berridge
PO Box 19928
Alexandria, VA 22320

EXAMINER

ALANKO, ANITA KAREN

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| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 06/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/069,754

Applicant(s)

WHATMORE ET AL.

Examiner

Anita K. Alanko

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 April 2005.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6-9 and 15-21 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1,2,4,6-9 and 15-21 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

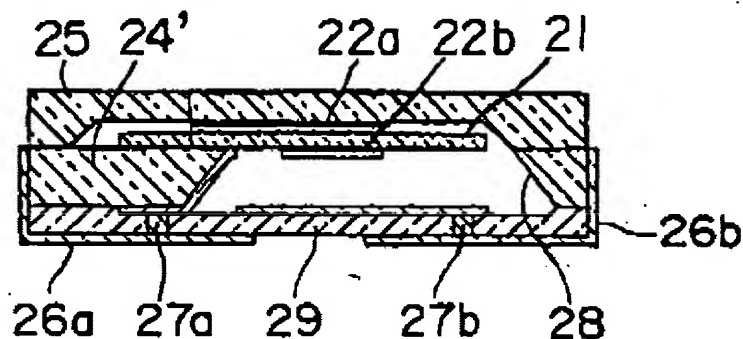
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-2, 4, 9, 15-17 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1).

Eda discloses a method for hermetically packaging a bulk acoustic resonator device

FIG. 31D



including the steps of:

providing a first wafer 24' ("holding wafer" Fig. 31D, col.42, lines 21-58, especially lines 51-52) having a first surface and a second surface that face toward opposite directions, with a bulk acoustic resonator device 21 disposed on the first surface (the top surface of 24'), the first wafer further having a cavity 28 formed at a position corresponding to the bulk acoustic resonator device and open at the second surface;

providing a second wafer 25 having a well (col.42, lines 36-37);

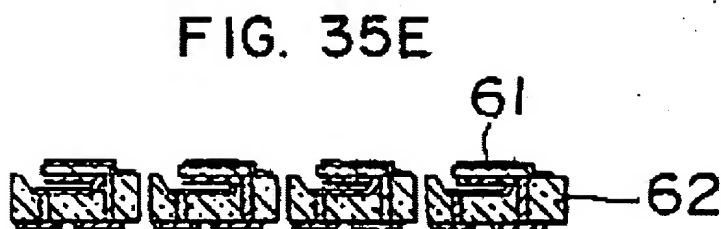
providing a third wafer 29 (col.42, lines 52-53);

bonding the second wafer to the first surface of the first wafer and bonding the third wafer to the second surface of the first wafer to form a composite wafer in which the bulk acoustic resonator device of the first wafer is aligned with the wells of the second wafer and sealed by the second wafer (col.42, lines 36-38) and the cavities of the first wafer are sealed by the third wafer (see Fig.31D).

Eda does not explicitly disclose that a plurality of bulk acoustic resonator devices are formed, that the first wafer has a plurality of cavities, or that the second wafer has a plurality of

wells. Rather, Eda depicts in Figure 31D that only one of each is formed. Eda also does not disclose to saw to separate the individual devices.

However, in a different embodiment Eda teaches that a plurality of bulk acoustic resonator devices (quartz plate 61 with electrodes 67, 63) can be formed on a first wafer 62, followed by sawing to separate the holding member (col.47, lines 40-41; Fig.35D-35E).



The advantage of forming a plurality of devices on a first wafer followed by separation is that they can be mass-produced (col.7, lines 65-67), which is a more efficient method of forming devices.

It would have been obvious to one with ordinary skill in the art to form a plurality of devices with a corresponding plurality of cavities and wells followed by sawing the composite wafer in the method of Eda because Eda teaches in a different embodiment that forming a plurality of devices on a substrate followed by separation is a useful technique for forming

devices and because Eda teaches that an advantage is mass production, which is a more efficient method of forming devices.

Eda discloses to pre-form holes so that the holes reach metal tracks connected to the bulk acoustic resonator devices (col.41, lines 64-66). Eda does not disclose to form holes in the composite wafer after formation of the composite wafer.

Kawai teaches that it is a useful to form holes after formation of a composite wafer and to thereafter fill the holes with metal for connection to metal tracks to devices formed in the composite wafer (col.9, line 60-col.10, line 14). The holes can be formed in either the top substrate or the bottom substrate (Fig.1, Fig.20). It would have been obvious to one with ordinary skill in the art to form the hole after formation of the composite wafer and to fill the holes with metal for connection in the method of Eda because Kawai teaches that it is known useful alternative technique to form holes after formation of a composite wafer rather than before.

As to amended claim 1, Eda does not disclose when to separate. Eda shows in a different embodiment that filled metal holes are formed prior to separation (Fig.35B), and therefore it is obvious to form the holes to completion prior to separation.

It would have been obvious to one with ordinary skill in the art separate after the wafer after the holes are filled with metal in order to enable efficient production by forming and filling many holes at the same time and then separating.

Further, since the same final product is formed, it is obvious to vary the order of steps to either before or after because the same final product results. In general, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical

or equivalent in terms of function, manner and result, was held to be not patentably distinguish the processes. *Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

As to claim 2, Eda discloses that the bulk acoustic resonator device comprises a piezoelectric layer 21 (quartz) sandwiched between two metal electrodes 22a, 22b (col.42, lines 26-28 and also Fig.31E).

As to claim 4, Eda discloses to deposit metal layers 26a, 26b (col.42, line 29) on the edges of chips including the bulk acoustic resonator devices in order to allow electrical contacts to be made to the bulk acoustic resonator devices. Eda does not disclose deposition of the metal layers after separation, however this would have been obvious to one with ordinary skill in the art in order to form a functional device after separation.

As to claim 9, Eda teaches that it is known to use to use a conductive adhesive to bond the substrates together (col.40, lines 23-26), which encompasses using a metal or alloy. It would have been obvious to use a conductive adhesive in the method of Eda because Eda teaches that using conductive adhesives is a known technique for bonding. Using a conductive adhesive inherently uses heat and pressure in order to have effective bonding.

As to claims 15-17 and 21, see the corresponding rejection of claims 1-14.

Claims 1-2, 4, 6-9 and 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and McReynolds (US 5,882,465).

The discussion of modified Eda from above is repeated here.

As to claim 6, Eda discloses to bond the quartz substrates together (col.39, lines 30+), but does not disclose to use a vacuum.

McReynolds teaches that it is useful to apply a vacuum during bonding in order to have optimal contact (col.5, lines 16-19) and to have a more even application of the pressure forcing the substrates together, which improves efficiency, quality and product yield (col.6, lines 49-61).

It would have been obvious to one with ordinary skill in the art to apply a vacuum as taught by McReynolds in the method of Eda because McReynolds teaches that to do so provides for optimal contact and for a more even application of the pressure forcing the substrates together, which improves efficiency, quality and product yield.

As to claim 7, Eda discloses to use anodic bonding (col.40, lines 4-15) with a silicate bonding layer (quartz). Eda does not disclose to employ a borosilicate bonding layer.

McReynolds teaches that quartz and borosilicate glasses are useful, alternative materials for one another (col.4, lines 25-37) and that quartz typically bonds at higher temperatures than borosilicate glass.

It would have been obvious to one with ordinary skill in the art to use borosilicate as a bonding layer in the method of Eda because McReynolds teaches that it is a known useful alternate silicate glass for quartz, and because McReynolds teaches that it has a lower bonding temperatures, which improves product yield.

As to claim 8, Eda discloses to use heating (col.40, lines 4-8), but does not disclose to use pressure.

McReynolds teaches that a useful bonding technique includes applying heat in combination with pressure (col.4, lines 19-22).

It would have been obvious to one with ordinary skill in the art to use heat and pressure during bonding in the method of Eda because McReynolds teaches that it is a useful technique for bonding.

As to claims 18-20, see the corresponding rejection of claims 6-8.

Claims 1-2, 4, 9, 15-17 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and Kurle et al (US 6,106,735).

The discussion of modified Eda from above is repeated here.

As to claim 1, Eda not explicitly disclose that a plurality of bulk acoustic resonator devices are formed, that the first wafer has a plurality of cavities, or that the second wafer has a plurality of wells. Rather, Eda depicts in Figure 31D that only one of each is formed. Eda also does not disclose to saw to separate the individual devices.

Kurle teaches a method for protecting sensors or arrangements from external influences by forming an airtight seal (col.4, lines 30-35). Electrical elements 2 are provided in a first wafer 1 and bonded to a second wafer 3. The second wafer has a plurality of wells (created by webs 4). During bonding, electrical elements 2 are aligned with the wells of the second wafer (col.2, lines 56-62, Fig. 1D). After bonding, the electrical elements 2 are separated into individual devices (col.3, lines 10-13) by sawing.

It would have been obvious to one with ordinary skill in the art to form a plurality of devices with a corresponding plurality of cavities and wells followed by sawing the composite wafer in the method of Eda because Kurle teaches that forming devices, bonding wafers and then

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sawing to separate devices is a useful technique for forming devices and because Eda teaches that an advantage is mass production, which is a more efficient method of forming devices.

Claims 1-2, 4, 6-9, 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and McReynolds (US 5,882,465) (as applied to claims 6-8 and 18-20) and Kurle et al (US 6,106,735) (as applied to claims 1 and 15).

The discussion of modified Eda from above is repeated here.

Response to Amendment

The 103 rejection over Eda alone is withdrawn in view of the cancellation of the product claims.

Claims 1-2, 4, 9, 15-17 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1).

Claims 1-2, 4, 6-9 and 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and McReynolds (US 5,882,465).

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Claims 1-2, 4, 6-9, 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and McReynolds (US 5,882,465)

(as applied to claims 6-8 and 18-20) and Kurle et al (US 6,106,735) (as applied to claims 1 and 15).

Response to Arguments

Applicant's arguments filed April 11, 2005 have been fully considered. The method claims are remain rejected over Eda and Kawai et al.

Kawai teaches that it is known to form a via hole for connection to metal tracks after formation of the composite wafer, as opposed to pre-forming the holes. It is an obvious extension that the via holes are filled before separation into individual devices to save time and money.

Applicant argues about Kawai being directing to a single angular velocity detecting element. This is not persuasive since Kawai is not relied upon to teach the specifics of the device in the composite wafer, the primary reference, Eda, already does that. Kawai does not discuss separation into individual products, however Eda does. Eda shows that filled metal holes are formed prior to separation (Fig.35B), and therefore it is obvious to form the holes to completion prior to separation.

Applicant argues that Eda does not disclose that the devices, after being separated, are "final products". Although products need packaging, Eda does suggest to form an airtight, closed cavity, which is, in a sense, a final product since the structure within the cavity and structures connected to the cavity have been formed to completion.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765